

DIVISION 5 — SANITARY SEWERS

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DIVISION 5

SANITARY SEWERS

501 GENERAL

501.01 AUTHORITY AND PURPOSE

- 501.01.A** These Design Standards shall apply to all improvements within existing and proposed public right-of-way and public easements, to all improvements to be maintained by the City, and to all improvements for which the City Code requires approval by the City. Most of the elements contained in these Design Standards are public works oriented and it is intended that they apply to both publicly financed public improvements under City contract and privately financed public improvements.
- 501.01.B** Private construction firms, Developers, consulting engineers, or any other individuals or business entities engaged in the design and construction of improvement projects that ultimately will be owned, operated, or maintained by the City shall comply in every respect with these standards. Where minimum values are stated, greater values should be used whenever practical; where maximum values are stated, lesser values should be used whenever practical.
- 501.01.C** The purpose of these Design Standards is to provide a consistent policy under which certain physical aspects of public improvements shall be implemented. All public system improvements and public works facilities shall be designed and constructed in accordance with all applicable rules and regulations of the City and any City interpretations of those rules and regulations, including applicable technical guidance manuals, and in accordance with all applicable federal, state, and local statutes and rules. Approval of public improvements must be made by the City Engineer or the Public Works Director before construction is permitted. An authorized representative of the City will be available for construction observation during construction of the project.
- 501.01.D** It is important to emphasize that these Design Standards are not intended to inappropriately restrict or constrain the originality or innovativeness of the Design Engineer and his or her ability to exercise and apply professional judgment to each situation and project. The City recognizes that every public improvement project has unique characteristics and situations. These Design Standards cannot provide for all situations and are intended to assist, but not to serve as a substitute for competent work by design professionals. It is expected that the Design Engineer will bring to each project the best of skills from the Design Engineer's respective discipline.
- 501.01.E** If the Design Engineer anticipates challenges in meeting these Design Standards, they should contact the City Engineer prior to extensive design efforts. The City Engineer will seek to work with each designer to achieve a satisfactory design and construction project that is in the best long-term interests of the City of Stayton and one that complies with all applicable rules and regulations.
- 501.01.F** These Design Standards are not intended to limit any innovative or creative effort which could result in better quality, better cost savings, or both. Any proposed departure from the Design Standards will be judged; however, on the likelihood that such variance will produce a comparable result, or long-term benefit to the City, in every way adequate for the intended purpose.



- 501.01.G** Requests for alternatives to these Design Standards will be considered for approval by the City Engineer as the need arises and conditions warrant modification. Request must show that the variance meets the intent of the Design Standards and will not compromise safety, impact other properties or cause an increase in maintenance. This consideration will be on a case-by-case basis and require sufficient justification prior to approval.
- 501.01.H** All franchise utility improvements, including telephone, electrical power, gas and cable TV shall meet the current standards of the appropriate agency as well as City Standards.
- 501.01.I** In the case of conflicts between the text of these Design Standards and the Standard Drawings, or between the provisions of these Design Standards and the Standard Construction Specifications, the more stringent as determined by the City Engineer shall apply.
- 501.01.J** All surveys for public works facilities shall be performed under the direction of a Professional Land Surveyor registered in the State of Oregon. All elevations shall be referenced to NGVD 29 vertical datum. Vertical benchmark locations shall be coordinated with the City.
- 501.01.K** On completion of projects to become public works, the Design Engineer shall submit one complete set of reproducible "Record Drawings" (As-Built), a compact disc (CD) containing electronic PDFs and cad files (AutoCAD version within 5 years of submittal, or others as approved) to the City Engineer. The drawings shall show any deviations from the original construction drawings and shall include sufficient information to accurately locate public works facilities. No bond will be released until the City Engineer receives an acceptable set of reproducible Record Drawings from the Design Engineer, with his/her stamp of certification.
- 501.01.L** For privately financed public improvements, the Design Engineer, at the completion of construction, shall submit a completion certificate to the City stating that all work has been completed in accordance with the approved project plans and specifications.
- 501.01.M** Before the City accepts a public works project for operation and maintenance, a one (1) year Warranty Bond on all materials and workmanship incorporated in the project shall be provided to the City.
- 501.01.N** The objective of these Design Standards is to meet the intent of the wastewater master plan and to ensure the following:
- ❖ The system shall be designed to provide necessary sanitary sewer infrastructure within the City of Stayton and shall incorporate system best management practices.
 - ❖ The system shall have the necessary hydraulic capacity to safely convey all design flows and shall be of sufficient depth to adequately serve the basin for which they are constructed. The use of individual sanitary sewer sump-pump systems for specific properties shall not be used unless approved by the City Engineer.
 - ❖ The system components shall have adequate structural strength to safely withstand all expected external design loads.
 - ❖ The system shall be designed and configured to prevent infiltration and inflow of ground and surface waters.
 - ❖ The system shall be designed to be economical and safe to construct and maintain.
 - ❖ The system shall be designed to minimize maintenance and operational requirements.



501.02 APPLICABILITY

- 501.02.A** The Design Standards document will govern all design, construction, or rehabilitation of sanitary sewers and related facilities within the City of Stayton and applicable work within its service areas. This document will be routinely referred to as the Design Standards.

501.03 REFERENCES

- 501.03.A** These Design Standards are intended to be consistent with the most current provisions of the documents and requirements listed and referenced in Subsection 101.03 and others specifically listed below. Projects are expected to be consistent with the following:
1. Applicable design criteria and concepts consistent with the most recent Wastewater Master Plan adopted by the City of Stayton unless more restrictive criteria are identified herein. Where additional detailed information and background is required for a particular project, the Wastewater Master Plan shall be referred and adhered to, as applicable. Any deviations from the Wastewater Master Plan shall be flagged and presented to the City Engineer for consideration. The most recent version of the City's sewer model (XP-SWMM) shall be used to model improvement requirements.
 2. Applicable design criteria and concepts in accordance with the rules and regulations of the Oregon Department of Environmental Quality (DEQ) as established in the Oregon Administrative Rules, Chapter 340, Division 52, and as presented in the DEQ publication "Oregon Standards for Design and Construction of Wastewater Pump Stations" and DEQ publication "Guidelines for Writing Pump Station O&M Manuals".
 3. State of Oregon Plumbing Specialty Code.
 4. Applicable design guidelines published by the American Society of Civil Engineers.

501.04 SPECIAL DESIGN APPLICATIONS

- 501.04.A** Special design applications not covered in these Design Standards require review and approval by the City. Additional review and approval by the Department of Environmental Quality (DEQ) may also be required. Submittal of full design calculations, supplemental drawings, and information will be required prior to any approval.
- 501.04.B** Such design applications requiring special review and approval include, but are not limited to, the following:
- ❖ Wastewater Facilities
 - ❖ Sewer Outfalls
 - ❖ Pump Stations and Force Mains
 - ❖ Electrical/Monitoring/Telemetry Devices
 - ❖ Siphons
 - ❖ Internal Sealing of Existing Sewers
 - ❖ Relining of Existing Mains
 - ❖ Energy Dissipators
 - ❖ Hydrogen Sulfide and/or Hazardous Gases



501.05 STANDARD CONSTRUCTION SPECIFICATIONS AND STANDARD DRAWINGS

- 501.05.A** Except as otherwise provided by these Design Standards, all construction design detail, workmanship, and materials shall be in accordance with the current edition of the City of Stayton Public Works Standard Construction Specifications and Standard Drawings.

501.06 CITY POLICY REGARDING ENGINEERING

- 501.06.A** It will be the policy of the City to require compliance with Oregon Revised Statute 672 for Professional Engineers.
- 501.06.B** Engineering plans, reports, or documents shall be prepared by a registered Professional Engineer or by a subordinate employee under the Design Engineer's direction, and shall be signed by the Design Engineer and stamped with the Design Engineer's seal to indicate responsibility for them. The Design Engineer shall review any proposed public facility extension, modification, or other change with the City prior to engineering or other proposed design work to determine if there are any special requirements or whether the proposal is permissible.
- 501.06.C** City approval of plans or any other engineering document produced by the Design Engineer does not in any way relieve the Design Engineer of responsibility to meet all applicable City, County, State, and Federal requirements, and the obligation to protect life, health, and property of the public. The plan for any project shall be revised or supplemented at any time it is determined that the project requirements have not been met.

501.07 CONVENTIONS USED THROUGHOUT THE DESIGN STANDARDS

- 501.07.A** See Subsection 101.07 for conventions used throughout these Design Standards.

501.08 ORGANIZATION AND CLASSIFICATION OF DIVISIONS

- 501.08.A** See Subsection 101.08 for the organization and classification of divisions throughout these Design Standards.

501.09 CLARIFICATIONS, MODIFICATIONS, AND REVISIONS TO DESIGN STANDARDS

- 501.09.A** These Design Standards will be periodically updated due to changes in policy or procedures, new technology, and methods of design and construction. Periodic revisions to these Design Standards will be necessary to maintain consistency in that regard. The date appearing on the title page is the date of the latest revision for each Division. Parenthetical notations at the bottom of each page indicate the most recent change. It will be the user's responsibility to obtain and maintain his/her copy of these Design Standards with the latest changes.
- 501.09.B** See Subsection 101.09 for general policies and procedures regarding clarifications, modifications, and revisions to the Design Standards.

501.10 DEFINITIONS AND TERMS

- 501.10.A** See Subsection 101.10 for standard definitions and terms used throughout these Design Standards.



502 GENERAL DESIGN REQUIREMENTS

502.01 PERFORMANCE STANDARDS

- 502.01.A** Sanitary sewer system design shall meet the policies and guidelines of the latest Wastewater Master Plan and its updates.
- 502.01.B** Sanitary sewer systems shall be designed to provide gravity service to all areas of development, unless otherwise approved by the City Engineer.
- 502.01.C** Sanitary sewer system capacity shall be designed for ultimate development density of the contributing area. The system shall allow for future system extension and for future development based on current and on proposed land use designations.
- 502.01.D** Sanitary sewer systems shall be designed to remove industrial waste and to remove domestic sewer from basements of houses (where practical), commercial or industrial buildings, and all public and private establishments where possible.
- 502.01.E** Stormwater and groundwater, including but not limited to, street, roof, footing drainage, water features, etc. shall not be connected to or will be allowed to discharge into the sanitary sewer system, but shall be removed by a system of storm drains or by some other method separate from the sanitary sewer system.
- 502.01.F** Unpolluted or non-contact cooling waters shall not be discharged into sanitary sewer systems. The overflow drains and filter backwash lines of swimming pools and "hot tubs" shall drain into a sanitary sewer system, in accordance with the Stayton Municipal Code requirements.
- 502.01.G** As a condition of sanitary sewer service, all developments will be required to provide public sanitary sewer systems to adjacent upstream parcels in order to provide for an orderly development of the drainage area. This shall include the extension of sanitary sewer mains in easements across the property to adjoining properties, and across and along the street frontage of the property to adjoining properties when the main is located in the street right-of-way. This shall include trunk lines that are sized to provide capacity for upstream development.
- 502.01.H** All public sanitary sewer systems shall be located within the public right-of-way or as directed and approved by the City Engineer. These sanitary sewer systems are placed in the public right-of-way for ease of maintenance and access, control of the facility, operation of the facility, and to permit required replacement and/or repair. The City Engineer, under special conditions, may allow a public sanitary sewer system to be located within a public sewer easement as referenced in Subsection 102.08.
- 502.01.I** Design shall comply with Oregon Department of Environmental Quality sewer design guidelines, OAR 340, Division 52.
- 502.01.J** For any project requiring construction within or adjacent to watercourses and/or wetlands, in addition to approval by the City, permits from the appropriate responsible agencies (Oregon Department of Fish and Wildlife, Oregon Division of State Lands, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, U.S. National Marine Fisheries Service, etc.) shall be obtained. Copies of all permits, or written evidence that no permit is required shall be given to the City prior to City approval of the construction plans.



- 502.01.K** When connection to a public sanitary sewer system is not practical as determined by the City, subsurface wastewater disposal may be permitted when approved by City Engineer and Marion County Sanitarian. All subsurface disposals shall meet and comply with Marion County and Department of Environmental Quality requirements.

502.02 SANITARY SEWER PLANS

- 502.02.A** Complete plans and specifications for proposed sanitary sewer projects, including any necessary public dedications and easements, shall be submitted to the City Engineer for review. Such plans and specifications must receive City Engineer approval prior to construction permit issuance and prior to beginning of construction. Engineering documents shall be prepared by a Professional Engineer registered and licensed in the State of Oregon.
- 502.02.B** Engineering design plans drawn to scale, showing the existing and proposed sewer system, shall be submitted in accordance with Division 2 of these Design Standards. The proposed plan shall show profile and plan view of the proposed improvements.

502.03 PIPE MATERIALS AND SIZE

- 502.03.A** All public sanitary sewer systems shall be constructed with ASTM D-3034, SDR35 PVC pipe as specified in the Standard Construction Specifications. Where required for added strength, AWWA C-900, or AWWA C-905 PVC Pipe shall be used. ASTM C-76 reinforced concrete pipe shall only be used where specifically approved by the City Engineer. Class 52 or higher ductile iron pipe shall be used when added strength is needed and pipe wall thickness is limited. Solid wall HDPE pipe may be used in boring, jacking, pipe bursting, and other similar applications when approved by the City Engineer. Tracer wire shall be a minimum 12-gauge, green-coated copper wire and shall be installed with all plastic pipe. Regardless of selected pipe material, all joints shall be watertight.
- 502.03.B** Regardless of the size of the area being served, the standard minimum pipeline diameter for all mainline sanitary sewers shall be 8-inches, unless otherwise approved by the City Engineer.
- 502.03.C** Proposed sewers that are larger than required, but which are solely recommended in order to meet grade requirements, are not allowed. Surcharging shall not be designed into the collection system.
- 502.03.D** Public sewer service laterals to single family residential properties shall be 4-inches in diameter. Minimum 6-inch diameter sewer service laterals shall be used for multi-family or commercial properties.
- 502.03.E** The pipe size shall be based on the minimum size needed for the design flow and not the size needed to result in a desired slope. The pipe size shall be determined by using one-half (1/2) of the maximum gravity flow capacity of the pipe for pipes 15-inches in diameter and less, and shall be two-thirds (2/3) for pipes larger than 15-inches in diameter.

502.04 SANITARY SEWER SYSTEM CLASSIFICATION

- 502.04.A** PRIVATE SERVICE LATERAL. A private service lateral is that part of each property's sanitary sewer service line that is on private property outside right of ways or public easements, typically 4-inches in diameter.



- 502.04.B PUBLIC SERVICE LATERAL.** A public service lateral is that part of each property's sanitary sewer service line which extends from the public sewer main to the limit of the public right of way, and is used for servicing the individual consumer, typically 4-inches in diameter. For sanitary sewer mainlines located within public easements, the limit of the public service lateral will be the edge of a sanitary sewer easement.
- 502.04.C COLLECTOR SEWER.** A public sewer main which one or more service laterals and/or other collector sewers connect or may connect, typically 8-inches in diameter.
- 502.04.D TRUNK SEWER.** A public sewer main ten (10) inches and larger which has been, or is being constructed to accommodate more than one collector sewer. Trunk Sewers may in some cases function as a collector sewer.

503 MINIMUM DESIGN CRITERIA

503.01 SANITARY SEWER STUDY

- 503.01.A** A separate study may be required by the City to justify a proposed project or development which poses unique or special situations or that is otherwise deemed necessary by the City. The sanitary sewer study shall provide detailed information on all engineering design aspects and considerations for City review and approval. The study shall include analysis of the potential upstream contributions and downstream capacities until the contribution is 10 percent or less of the total flow. The study shall include, but not be limited to, sewer service area map, sewage flow calculations, pump systems, and pipe hydraulic calculations. The study shall project sewer grade to upstream parcels within the basin to assure gravity service. The study map shall include as a minimum the following:
- ❖ Streets and street names
 - ❖ Lot lines
 - ❖ Contours or other form of ground surface elevation information
 - ❖ Proposed and future pipe system, complete with manholes, pipe slopes, manhole flowline elevations, and pipe sizes
 - ❖ Existing gravity stormwater drainage systems and other possible conflicting utilities
 - ❖ Ultimate service area boundaries (from Wastewater Master Plan and consultation with the City)
 - ❖ Delineated Sub-service area boundaries according to land use, as appropriate
 - ❖ North arrow, scale, etc.
 - ❖ Company name, designer's name, date, etc.
 - ❖ Link-node data set with coordinates in digital format, if applicable
- 503.01.B** Design calculations for pump stations, pipe sizing and design flows must be stamped by an Oregon Registered Professional Engineer and submitted to the City.
- 503.01.C** When two or more existing sanitary sewers are available for use by a new development, an engineering study may be required to ensure adherence to established sanitary sewer drainage boundaries.

**503.02 DESIGN FLOW CRITERIA**

- 503.02.A** All collection system components shall use and be consistent with the engineering design criteria and concepts presented in the most recent Wastewater Master Plan and updated environmental regulations and/or monitoring/modeling information. Where additional detailed information and background is required for a particular project, the Wastewater Master Plan shall be referred and adhered to. Each system shall be designed to serve its respective drainage basin, as shown in the most current Wastewater Master Plan.
- 503.02.B** In sizing the collection system, the general wastewater design flow criteria to be followed is shown in the Table below (refer also to the Wastewater Master Plan). The wastewater design flow criteria shown in the Table below may be modified if more current or other relevant information is available to support the change. Population calculations used to forecast service area flows shall be consistent with the Wastewater Master Plan. The Design Engineer shall refer to and coordinate with the most recent version of Stayton's Comprehensive Plan.
- 503.02.C** In addition to the wastewater design flow criteria listed below, all sewers shall be designed with reserve capacity to allow for unforeseen increases in flow due to land-use changes. The Design Engineer shall be prepared to submit for review pipe-sizing design calculations. These calculations shall include the maximum and minimum daily flows based upon population estimates, land-use assumptions, and all other assumed factors relative to the wastewater design flow criteria listed in the Table below.
- 503.02.D** If there are no specific project values for the amount of sewage to be generated, the following design values shall be used:

WASTEWATER DESIGN FLOW CRITERIA	
Persons per Single Family Residence	2.7
Residential Average Flow Allowance	100 gal/per-capita/day
Multi-Family/Commercial/Commercial Retail Average Flow Allowance	1,500 gal/gross-acre/day
Industrial Commercial Average Day Flow Allowance	1,500 gal/gross-acre/day
Light Industrial Average Day Flow Allowance	2,000 gal/gross-acre/day
Industrial Ag Average Day Flow Allowance	2,500 gal/gross-acre/day
Heavy Industrial Average Day Flow Allowance	2,500 gal/gross-acre/day
Residential Flow Peak Day Factor	2.5
Residential Flow Peak Hour Factor	3.0
Commercial Flow Peak Hour Factor	Project specific (3.0 min)
Industrial Flow Peak Hour Factor	Project specific (3.0 min)
Service Area Infiltration/Inflow Allowance (see 503.02.E below)	1,000-gal/gross-acre/day

- 503.02.E** In addition to the daily wastewater design flows shown in the Table above, an allowance of 1,000-gallons/gross-acre/day shall be added for all the land area in the basin being served to account for inflow and infiltration (I&I). A peak hour factor of 3.0 minimum shall be applied to the daily wastewater flow. The wastewater design flow in gallons per day (gpd) is then calculated as: (Acres * (1,000 + DWF * 3.0)) where DWF = Daily Wastewater Flow in gpd/acre from Table above.

**503.03 VELOCITY AND SLOPE**

- 503.03.A** All sanitary sewer pipes shall be designed at a grade that produces a mean velocity of the sanitary sewer design flow of no less than 2-feet per second and not more than 15-feet per second when the pipe is flowing full or half-full. If topography requires a grade that would result in a velocity greater than 15-feet per second in one pipe section, additional drop manholes shall be installed as required by the City. The velocity shall be calculated using the sanitary sewer design flow for the basin to be served now and at ultimate design flow in the future.
- 503.03.B** All sewers shall be laid on a consistent and uniform grade. Changes in piping size and grade shall only occur at manholes.
- 503.03.C** For verification purposes the following Table of minimum pipe slopes shall be used. Actual slopes shall be determined by the actual sanitary sewer design flow.

Pipe Size (Inches)	Slope in Percent (feet per 100 feet)
8	0.40
10	0.28
12	0.22
15	0.20
18	0.20
21 and larger	0.20

- 503.03.D** All sanitary sewer systems laid on slopes greater than 15 percent, or as recommended by pipe manufacturer for slopes 15 percent and less, shall be secured by anchor walls in accordance with the Standard Drawings. Anchor walls located at the middle of pipe runs of less than 200 feet between manholes are generally adequate, but for spans greater than 200 feet, anchor walls shall not exceed a spacing of 100 feet.

503.04 HYDRAULIC DESIGN

- 503.04.A** The Design Engineer shall submit calculations for each sanitary sewer system to be installed, exclusive of sewer service laterals.
- 503.04.B** When calculating volumes, slopes, and velocities, the Manning Formula shall be used. Note that new PVC or HDPE pipe likely have a manufacturer's "n" value of approximately 0.009. However, regardless of pipe material, sand, grit, and slime will build up on pipe walls. This results in true "n" values over time of approximately 0.013. As a consequence, a Manning coefficient of 0.013 shall be used for design of PVC or HDPE piping systems. If an alternative piping material is approved, either the pipe manufacturer's recommended coefficient shall be used or an "n" value of 0.013, whichever is greater.



503.04.C The Manning Formula is expressed by the following equation:

$$V = (1.486/n) * (R^{(2/3)}) * (S^{0.5})$$

Where:

V = Mean velocity of flow in feet per second ($V=Q/A$).

n = Manning's n, 0.013 minimum for pipe.

R = Hydraulic Radius in feet, defined as the area of flow divided by the wetted perimeter (A / WP);

A = cross sectional flow area in square feet.

WP = wetted perimeter in feet.

S = Slope of hydraulic grade line in feet per foot.

503.04.D In terms of discharge, the above formula becomes:

$$Q = (1.486/n) * A * (R^{(2/3)}) * (S^{0.5})$$

Where:

Q = rate of flow, cfs;

V = Mean velocity of flow in feet per second ($V=Q/A$).

n = Manning's n, 0.013 minimum for pipe.

R = Hydraulic Radius in feet, defined as the area of flow divided by the wetted perimeter (A / WP);

A = cross sectional flow area in square feet.

WP = wetted perimeter in feet.

S = Slope of hydraulic grade line in feet per foot.

504 ALIGNMENT AND COVER

504.01 RIGHT-OF-WAY LOCATION

504.01.A Sanitary sewer systems shall be located in the street right-of-way and shall be located 5-feet north or east of the right-of-way centerline as shown in the Standard Drawings. Any deviations will be reviewed on a case-by-case basis and will require City approval.

504.01.B Curved alignments in sanitary sewer systems, vertically or horizontally, are not permitted.

504.01.C All changes in direction and size of pipe shall be made at an approved manhole.

504.01.D Where approved by the City Engineer, public sewer systems serving a master planned development, apartment complex, or commercial/industrial development shall be in parking lots, private drives, or similar open areas that will permit an unobstructed vehicle access for maintenance by City forces.

504.02 MINIMUM COVER

504.02.A All sanitary sewer systems shall be laid at a depth sufficient to drain sewer service laterals, to protect against damage by frost or traffic, and to drain basement sewers where practical. Sufficient depth shall mean the minimum cover from the top of the pipe to finish grade at the sanitary sewer alignment. In new residential hillside subdivisions, mainline and sewer service laterals shall be placed in the street at a depth sufficient to drain sewer service laterals on the low side of the street.



504.02.B Sanitary sewer systems in residential areas shall be placed with the following minimum cover, unless otherwise approved by the City Engineer:

1. PUBLIC SEWER SERVICE LATERALS – 5-feet at roadway curb and gutters, measured from the top of pipe to roadway gutter finish grade (flow line).
2. PUBLIC SEWER MAINS (TRUNKS AND COLLECTORS) – Generally 6-feet to 8-feet in roadways and easements, measured from the top of pipe to roadway or easement finish grade.

504.02.C Deviations from the above standards will be considered when one of the following circumstances exists. Deviations will require City approval and will be reviewed on a case-by-case basis.

1. EXISTING SHALLOW SEWERS – Where the topography is relatively flat and existing sewers are shallow (5-feet or less), the minimum cover shall be 4-feet, measured from top of pipe to finish grade.
2. UNDERLYING ROCK STRATA – A request in writing to the City Engineer, together with submittal of a soils report, with a plan and profile certifying that bedrock exists 3-feet below the undisturbed ground surface at all investigated alignments.
3. A DITCH OR STREAM MUST BE CROSSED – A plan and profile showing ditch or stream crossing; horizontal scale 1-inch = 20-feet, vertical scale 1-inch = 2-feet.

504.03 SEPARATION FROM WATERLINES

504.03.A Sanitary sewer systems shall be installed a minimum clear distance of 10-foot horizontally from waterlines and shall be installed to go under such pipes with a minimum of 18-inch of vertical clearance at the crossing of these pipes (in accordance with the requirements of OAR Chapter 333, Public Water Systems (See 333-061-0050)). Deviations shall first be approved by the City Engineer before submittal for approval by State agencies. In all instances the distances shall be measured edge to edge.

504.03.B The basic separation requirements will apply to all gravity and pressure sewers of 24-inch diameter or less. Larger sewers may create special hazards because of flow volumes and joint types, and accordingly require additional separation requirements. The special construction requirements given are for the normal conditions found with sewer and water systems. More stringent requirements may also be necessary in areas of high ground water, unstable soil conditions, or other special site conditions. Any site conditions not conforming to conditions described in this Section will require assessment and approval by the City and appropriate State agencies.

504.03.C Where an individual property is served by a private pump station with a force main discharging to a public sanitary sewer system at the property line, and a domestic water well is also located on that same property, either State of Oregon Plumbing Specialty Code or Department of Human Services – Drinking Water Program specified separation of sanitary sewer and waterlines shall apply.

504.04 ACCESS AND UTILITY EASEMENTS

504.04.A When, in the Design Engineer's opinion, it is impractical to locate public utilities in rights-of-way, the utilities shall be placed in an easement, as approved by City Engineer. All public utility easements granted to the City shall be perpetual easements and shall conform to the requirements of Section 102.08.



504.05 RELATION TO WATERCOURSES

- 504.05.A** Generally, the top of all sanitary sewer pipes entering, crossing, or adjacent to streams shall be at a sufficient depth below the natural bottom of the streambed to protect the line. A minimum of 1-foot of cover is required where the sanitary sewer line is in rock; 3-feet of cover is required in other materials.
- 504.05.B** Sanitary sewer lines located along or parallel to streams shall be located outside of the streambed and sufficiently removed therefore to provide for future, possible stream channel widening. All manhole covers at or below the 100-year flood elevation shall be watertight.
- 504.05.C** Sanitary sewer lines crossing streams or drainage channels shall be designed to cross the stream as nearly perpendicular to the stream channel as possible.
- 504.05.D** The pipe material shall be ductile iron in accordance with Subsection 502.03. The specified pipe type shall extend to a theoretical point where a one-to-one slope begins at the top of the bank and slopes down from the bank away from the channel centerline and intersects the top of the pipe.
- 504.05.E** Each deviation from the above requirements will be reviewed by the City Engineer on a case-by-case basis.

505 STRUCTURES

505.01 MANHOLES

505.01.A GENERAL

1. Manholes for mainlines shall be located at all changes in pipe slope, grade, alignment, size, type, and at all pipe junctions with present or future sanitary sewer lines. A manhole shall be placed at the upstream end of each mainline, 7-feet maximum from property line to centerline of manhole.
2. Manhole spacing shall not exceed 450-feet. Deviation from this standard will be considered based on whether or not flushing, cleaning, and closed-circuit television inspection equipment can adequately service the proposed spacing.
3. For ease of maintenance and inspection, manholes shall be installed within the right-of-way of paved public streets. If a manhole must be located outside of the public street right-of-way, access to the manhole shall be provided by means of an easement having a width consistent with Section 102.08. The easement shall be complete with an all-weather driveable surface from the adjacent public street to the manhole. The driveable surface shall extend to a point at least 10-feet beyond the manhole for equipment access.
4. Where practical, manholes shall be located at street intersections and shall be located outside the normal wheel paths. Manhole lids are not permitted within designated existing or future bike lanes. Manholes shall not be placed in curbs or gutters or behind curbs. Manhole lids shall have a minimum of 12-inches of clearance from the edge of a curb and gutter.



5. Manholes located in unimproved areas shall have their lids positioned approximately 1-foot above the surrounding grade and be marked with City approved metal marker post. Manholes located in backyards, side lots, or otherwise substantially outside of the traveled right-of-way, may require tamperproof, locking lids. For public lines in easements within parking lots or other similar traveled areas, locking lids will generally not be required. In all areas prone to ponding, flooding, or along stream corridors, and in all areas below the 100-year flood plain, waterproof covers shall be installed. These types of manhole locations should be avoided whenever feasible and practical. Non-standard locations will require review by the City on a case-by-case basis.
6. Two manholes shall be provided for locations where the horizontal angle between the outgoing sanitary sewer and the incoming line will be less than 90 degrees. This is intended to prevent wastewater from discharging into the oncoming flow of an opposing sewer.
7. Where internal system overflows may occur and covers are intended to prevent such overflows, the manhole cone and cover shall be designed to resist the resulting hydrostatic forces and be provided with vent piping. Vent piping configuration and cone and cover restraint will be reviewed by the City on a case-by-case basis.

505.01.B DROP THROUGH MANHOLES

1. Standards for elevation differences at manholes have been established to compensate for normal energy losses and to prevent surcharging of the sanitary sewer system. For purposes of slope calculation and for establishing elevation differences, the elevations are given at the theoretical horizontal intersection of the sanitary sewer centerlines (usually the center of the manhole). The rules for elevation differences at manholes are:
 - a. Where the pipe size decreases upstream through the manhole, the upstream pipe crown shall match the elevation of the crown of the downstream pipe. Where grade is limited, matching 0.8 of the pipe diameters may be used. If the incoming and outgoing pipes are of equal size and are passing straight through the manhole, the invert elevation difference shall be at least 0.10-feet. Manhole channels shall meet the requirements of the Standard Construction Specifications.
 - b. If the pipe alignment changes at the manhole, the invert elevation difference shall be at least 0.10-feet for 0 to 45 degrees of horizontal deflection angle, and 0.20-feet for 45 to 90 degrees of horizontal deflection angle. Horizontal deflection angles of greater than 90 degrees are not allowed. New piping, which is to be connected to existing manholes, shall generally adhere to these same hydraulic considerations. Existing concrete channels within the manhole shall be modified accordingly.
 - c. Outside drop manholes shall be constructed in accordance with the Standard Drawings whenever a vertical separation exists between the inlet and outlet piping that is more than 2-feet. Prior approval by the City Engineer will be required for the use of any inside drop manhole. Outside drop assemblies shall only be used for pipelines 12-inches in diameter and smaller. Larger pipelines shall be introduced into the manhole at the manhole invert. Overall, drop manholes will only be allowed in cases of significant elevation differences between incoming and outgoing lines, or when special conditions exist such as a conflict with existing facilities or utilities that cannot be resolved.
2. Connections must enter the manhole through a channel in the base. This includes drop connections and connections to existing manholes.



505.01.C MANHOLE STANDARD DRAWINGS

1. Manholes shall have a minimum inside diameter of 48-inches and shall be in compliance with the Standard Construction Specifications. Manhole to piping connections shall be made with watertight, flexible manhole/pipe rubber connectors, as shown in the Standard Drawings.
2. The manhole Standard Drawings are suitable for most conditions. New designs or revisions should not be shown on the construction plans unless the Standard Drawings are not suitable. New or revised designs may be necessary if:
 - ❖ One or more of the sewers to be connected to the manhole is over 27-inches in diameter. (smaller diameters may require a special design if the manhole is at an alignment change)
 - ❖ Several sewers will be connected to the manhole.
 - ❖ There is less than 90 degrees between the incoming and outgoing sewer.
 - ❖ The manhole will be subject to unusual structural loads.
 - ❖ Diversion or other flow control measures are required.
3. If a special design is required for any reason, it will be necessary to show that design on the construction plans and to provide the City Engineer with structural calculations if so requested.
4. Some alternate manhole features are shown in the Standard Drawings. Where these features are required, they shall be specified by a note on the construction plans. Some examples are:
 - ❖ Slab tops shall be used in lieu of cones where there will be less than 5-feet between the invert of the outlet pipe and the top of the manhole lid.
 - ❖ Watertight manhole frames and covers shall be used if floodwaters are expected to cover the manhole top or if the manhole must be located in the street gutter. Such conditions should be avoided wherever feasible.
 - ❖ Tamperproof manhole frames and covers are required in all areas outside the paved public right-of-way.

505.02 CONNECTION TO EXISTING SEWERS

505.02.A Connections to, and extensions of, existing sanitary sewer systems will occur to facilitate new development. The connection methods and/or locations shall be carefully reviewed by the Design Engineer and is to be approved by the City Engineer.

505.02.B In general, connections to existing manholes shall be made with the following guidelines:

1. Where the invert of the connecting pipe is 2-feet or less above the invert of the outgoing pipe, the sewage entering the manhole shall follow a smooth concrete channel transitioning evenly from the invert of the inlet pipe into main channel.
2. Where the invert of the connecting pipe is more than 2-feet, the Contractor will be required to construct an outside drop per the Standard Drawings for pipes 12-inches and smaller. Drops for larger pipes will not be allowed. Prior approval by the City Engineer will be required for the use of any inside drop manhole. Sanitary sewer entering the manhole shall follow a smooth concrete channel transition from the bottom of the drop into the main channel.



3. Where the invert is required to enter below the shelf of the manhole, the inlet pipe shall not enter below a point where the crown of the new inlet pipe is below the crown of the outlet pipe. The base of the manhole shall be rebuilt if damaged in this process. The sanitary sewer flow shall enter the main flow in a smooth channel transitioning from the inlet pipe to the main channel.
4. No pipe shall enter an existing manhole where the angle between the incoming flow and the outgoing flow is less than 90 degrees.
5. Where a connection is proposed to an existing manhole, elevation of the existing shelf, location of steps, and elevations of existing inlets and outlets shall be submitted with the plans. Existing manholes which are located within proposed sidewalk areas shall be flush with the finished surface and shall be fitted with standard locking manhole lids.

505.03 MAINLINE CLEANOUTS

- 505.03.A** Cleanouts will not be approved as substitutes for manholes on public sanitary sewer lines. Cleanouts are permitted at the upper end of a sanitary sewer system that is designed to be extended during a phase of construction, as approved by City Engineer. The distance between the cleanout and a manhole is a maximum of 150 feet. The standpipe shall be the same size as the pipeline up to a maximum of 8-inches. If future extension requires a change in pipe slope, alignment, size, or type, a manhole will be required at the cleanout location.
- 505.03.B** Temporary cleanouts may be installed within the right of way at the end of a stub street where the street is expected to be extended in the future and the design of the sewer system does not warrant that a manhole be constructed at this location. The maximum distance of a main line extension without a temporary cleanout is 15 feet. The City will make the determination when and where temporary cleanouts are allowed. When the sewer is extended, the temporary cleanout shall be removed.

505.04 GREASE INTERCEPTORS

- 505.04.A** Grease interceptors will be required in establishments where, in the opinion of the City Engineer or Public Works Superintendent, grease may be introduced into the drainage of sewage system in quantities that can affect sewer flow, hinder sewage treatment, or private sewage disposal.
- 505.04.B** Establishments that require grease interceptors generally provide foods or beverages for sale or central food preparation as part of its service to residents, customers, or employees. A grease interceptor will not be required for individual dwelling units or for any private living quarters.
- 505.04.C** Grease interceptors shall be designed so that it can be easily cleaned, be properly vented, and shall be sized in accordance with the most current version of the Oregon Plumbing Specialty Code and Standard Drawings. The flow rate through a grease interceptor shall not exceed its rated capacity.
- 505.04.D** Manufactured grease interceptors shall be approved for use in the State of Oregon.



506 SEWER SERVICE LATERALS

- 506.01.A** Sewer service laterals are those public sanitary sewer lines to which a private building sewer connects. Each individual building lot shall typically be connected by a single, separate, private, building-sewer/sewer lateral line connected to the public sanitary sewer system. Individual sewer service laterals shall be located no closer than 10-feet from adjacent property lines (property lines which are perpendicular to public right-of-way). All public service laterals shall extend from the sanitary sewer mainline to the private property line, where a two-way property line cleanout shall be installed. A continuous tracer wire shall be installed from the main to the clean-out of the sewer service lateral at the right-of-way.
- 506.01.B** Sewer service laterals within public right-of-way shall conform to public works standards. Sewer service laterals outside of public right-of-way shall conform to State and local plumbing codes. No roof runoff, foundation drain, or stormwater line of any kind shall be connected to sewer service laterals. Laterals, which serve individual single-family residences or equivalent dwellings, shall be 4-inches in diameter. Multi-family dwellings or commercial buildings shall have 6-inch laterals. No 4-inch or 6-inch sewer service lateral from adjacent private property will be allowed to be connected directly to a manhole.
- 506.01.C** Sewer service laterals shall be built to the same standards and of the same materials as the sanitary sewer main line. In general, sewer service laterals shall be placed at 90 degrees to the sanitary sewer main line to avoid excessive exposure to other utilities during excavation for construction or maintenance of the sewer service laterals. Angles other than 90 degrees (45 degrees minimum) may be approved by the City Engineer for cul-de-sac lots.
- 506.01.D** The minimum slope of sewer service laterals shall be 2 percent; except that for unusual conditions, a slope of 1 percent may be approved by the City Engineer. The Design Engineer will be required to provide a complete analysis of the need for any sewer service lateral slope less than 2 percent. Depth of public sewer service laterals shall be in accordance with Section 504.02.B.
- 506.01.E** The following additional requirements apply to public service laterals:
1. Sewer service laterals shall be connected to sewer mains using approved manufactured fittings.
 2. For existing homes without sanitary sewer service or for vacant lots, new public sewer service laterals shall be provided as part of new development projects or other street rehabilitation/utility projects.
 3. The length of sewer service laterals shall generally be limited to 100-feet. Cleanouts shall be installed every 100-feet if longer sewer service laterals are allowed. Where one or more sewer service laterals will exceed 100-feet in length in order to serve the adjacent private property, a public main and manhole may be required and located within an easement, as approved by the City Engineer.
 4. Backwater check valves and isolation gate valves are required for all buildings where potential flooding exists if the public sanitary sewer system were to backup. These valves shall be private valves installed as part of the private sewer service piping.



507 PRIVATE SEWER SYSTEMS AND PRIVATE BUILDING SEWERS

- 507.01.A** Private sewer systems and private building sewers shall be installed on private property in accordance with the requirements of the State of Oregon Plumbing Specialty Code.
- 507.01.B** Easements for private sewer systems and private building sewers are the responsibility of the property owners; but copies of the recorded easements must be given to the City Engineer prior to any construction.
- 507.01.C** Private sewer systems and private building sewers will not be permitted within the public right-of-way.
- 507.01.D** Private sewer systems and private building sewers shall be connected to the public sewer system at a two-way property line cleanout for gravity single family and multi-family residences and a standard manhole within the public right-of-way or easement for all other private sewer connections, unless approved otherwise by City Engineer. Immediately upstream of the connecting manhole at the property line, a separate monitoring manhole will be required. The monitoring manhole shall be as shown in the Standard Drawings.

508 PUMP STATIONS

508.01 GENERAL

- 508.01.A** Pump stations will not be allowed if other options exist for gravity sewer flow. If allowed by the City, pump stations must be consistent with the approved Wastewater Master Plan and approved by City Engineer.
- 508.01.B** Pump stations shall be a submersible pump-type facility and shall meet or exceed the minimum requirements of the Oregon Department of Environmental Quality (DEQ) as established in the Oregon Administrative Rules, Chapter 340, Division 52, and as presented in the DEQ publication "Oregon Standards for Design and Construction of Wastewater Pump Station." Where conflicts exist between the Design Standards and the aforementioned documents, or any other technical specifications identified therein, the most stringent requirements shall take precedence.

508.01.C PUMP STATION FACILITY

1. The pump station facility shall include, but not be limited to the following:
 - ❖ Submersible pumps
 - ❖ Wet Well
 - ❖ Valve Vault
 - ❖ Bypass pump out connection
 - ❖ Associated Piping and Valves
 - ❖ Electrical Controls
 - ❖ Instrumentation
 - ❖ Telemetry to City system.
 - ❖ Access Road and Parking Area
 - ❖ Fencing, Landscaping
 - ❖ Potable Water Supply
 - ❖ Backup Generator w/ noise silencer, if required
 - ❖ Others, as deemed appropriate by the City



508.01.D PUMP STATION CAPACITY

1. Pump station shall be designed to pump the peak wastewater flow from the service area. When the service area is not built-out, staging of pump station capacity may be allowed.

508.01.E STANDBY POWER

1. All sewage pump stations shall be designed with capability for emergency power in case the primary electrical feed is out of service. Unless approved otherwise by the City Engineer, all pump stations shall have a permanent engine generator unit with automatic transfer switches to transfer the electrical feed from the primary to the standby unit when a power failure is detected by the instrumentation and control system.
2. Determining the engine generator's size depends upon the requirements of starting and operating the pumps at peak possible load and all ancillary equipment in the sewage pump station that could operate during a power outage. All sizing shall be coordinated with the manufacturer.

508.01.F LOCATION

1. The pump station facility shall be easily accessible and shall be vertically located at least 2-feet above base flood elevation. Pump station shall comply with the distance and utility separation requirements in accordance with DEQ guidelines.

508.02 DESIGN CRITERIA

508.02.A CALCULATIONS

1. Service area, peak flow, and other pump station calculations shall be submitted to the City Engineer and DEQ for review and approval within a pre-design study in accordance with DEQ requirements.

508.02.B STORAGE VOLUME

1. The wet well shall be designed to provide 4-hours of wastewater inflow storage, per Subsection 503.02, above high water alarm elevation.

508.02.C SUBMERSIBLE PUMPS

1. A minimum of two (2) submersible pumps shall be supplied. Each pump shall be capable of pumping the peak wastewater flow. Where more than two (2) pumps are used, the station shall be able to pump peak wastewater flow when the largest pump is out of service.
2. Pumps shall be submersible pumps manufactured by FLYGT (or approved equal), explosion-proof, suitable for hazardous location, capable of passing solids and shall be UL or FM listed.
3. Pumps shall be readily removable and replaceable without dewatering the wet-well or requiring personnel to enter the wet-well. Check valves and isolation valves shall be mounted outside the wet-well to facilitate access and contained in a structure suitable for protection against vandalism.



4. Control panels shall be physically separated from the wet-well, meet the requirements of the NEC, NFPA, and be suitably protected from the weather, humidity, and vandalism. The pumps shall be explosion-proof unless the control system can provide adequate assurance that pump motors in operation are submerged at all times. Electrical junction boxes shall be easily accessible without entering the wet-well.

508.02.D PIPING AND VALVES

1. All pump stations shall be provided with a valve vault for valves, piping, air and vacuum relief valves, and surge control components. Each pump discharge shall include a check valve, an isolation valve, and pressure gauge.
2. Sewage pump stations that discharge into long force mains in which there is high likelihood of grease buildup or where the force main will have low velocities, shall be equipped with valves, piping, and end cap for launching of a pig to remove buildups of undesirable materials in the force main. See Section 508.02.J.11. Also, long force mains shall be designed to control hydrogen sulfide and other hazardous gases.

508.02.E ELECTRICAL

1. Electrical controls shall be located above ground mounted in a waterproof enclosure and should be oriented facing away from prevailing weather. Electrical panels shall be UL listed. The pump station wet well shall be considered a hazardous location.

508.02.F CONTROLS

1. Pump stations shall utilize a PLC-based control system.
2. An ultrasonic level transducer shall control pump operation and alarms.
3. A redundant float activated circuit shall provide a fail-safe, high-water alarm system. The brand and model of the programmable logic controller, as well as other devices, should be obtained from the Public Works Superintendent in order to ensure compatibility with the existing system.
4. Control system design shall be subject to the approval of the City Engineer.

508.02.G ALARMS AND TELEMETRY

1. Alarms shall be telemetered to the City of Stayton Wastewater Treatment Plant. Telemetry shall conform to specifications and requirements provided by the Public Works Superintendent to ensure compatibility with existing systems. Required alarms include:
 - ❖ High water
 - ❖ Low water
 - ❖ Power failure
 - ❖ Pump failure
 - ❖ Telemetry failure
 - ❖ Others, as required by City

508.02.H LANDSCAPING AND FENCING

1. Landscaping and fencing shall be in accordance with the Stayton Municipal Code, DEQ requirements, and as required by the City Engineer.



508.02.I ADDITIONAL FEATURES

1. Provide 1-inch hose bib at valve vault. Potable water shall be provided by reduced pressure backflow preventer.
2. Provide positive ventilation in valve vault.
3. Provide odor control systems as required by DEQ and the City Engineer.
4. Provide analysis to determine if hydrogen sulfide or other hazardous gas control system is required and provide as necessary.

508.02.J FORCE MAINS

1. SIZE
 - a. Except for small grinder and effluent pump installations, piping for force mains shall not be less than four inches in diameter. Force main headloss will determine pipe diameter; however, as a general rule, whenever the velocity exceeds 8 fps, a larger pipe shall be used.
2. VELOCITY
 - a. At pumping capacity, a minimum self-scouring velocity of 2 fps shall be maintained unless flushing facilities are provided. Velocity shall not exceed 8 fps. Optimum velocities for reducing maintenance costs and preventing accumulation of solids range between 3.5 and 5 fps.
3. AIR RELIEF AND VACUUM VALVES
 - a. An air relief and/or vacuum valves shall be placed at high points in the force main to relieve air locking or supply adequate air during vacuum scenarios. The surge effect on the system shall be considered when sizing these valves.
 - b. Air relief and vacuum valves shall not be in combination. Separate valving is required and shall be equipped with isolation valves, be located directly above the force main, and designed with a cleanout or flushing attachments to facilitate maintenance. These valves shall be protected from freezing and from damage by heavy equipment.
4. BLOW-OFFS
 - a. A blow-off shall be installed at low points of force mains where gritty material can accumulate and restrict flow.
5. TERMINATION
 - a. The force main shall be aligned to enter the receiving manhole with its centerline horizontal to the outlet piping and at an invert elevation that will ensure a smooth transition of flow to the gravity flow section. In no case however, shall the force main enter the gravity system at a point more than 1-foot above the flow line of the receiving manhole. The design shall minimize turbulence at the point of discharge.



- b. Consideration shall be given to the use of inert materials or protective coatings for the receiving manhole to prevent deterioration from hydrogen sulfide or other chemicals.

6. CONSTRUCTION MATERIALS

- a. Materials to be considered for force mains shall include ductile iron, steel, polyethylene, polyvinyl chloride (PVC), and pre-stressed and reinforced concrete. The pipe material and interior lining shall be selected to adapt to local conditions, including industrial waste and soil characteristics, exceptionally heavy external loading, internal erosion, corrosion, and similar problems. The system design and surge allowances may preclude the use of some materials.
- b. Installation specifications shall contain appropriate requirements based on the criteria, standards, and requirements established by the industry in its technical publications. Requirements shall be set forth in the specifications for the pipe and methods of backfilling to preclude damage to the pipe or its joints, impede future cleaning operations, prevent excessive side pressures that may create deformation of the pipe, or seriously impair flow capacity.
- c. All pipes shall be designed to prevent damage from superimposed loads. Proper allowance for loads imposed on the pipe shall be calculated for the width and depth of the trench.

7. PRESSURE TESTS

- a. All force mains shall be hydrostatically tested at a minimum pressure of at least 1.5 times above the design working pressure. Leakage shall not exceed the amount given in the following formula:

$$L = (ND\sqrt{P}) / 7400$$

L = allowable leakage, gallons per hour

N = number of joints in length of pipeline tested

D = nominal diameter of the pipe in inches

P = average test pressure during the leakage test (psig)

8. CONNECTIONS

- a. In order to avoid shearing force main pipes because of differential settlement, flex couplings shall be used on force main pipes between the pump station structures, such as the pump station and the valve box. Flex couplings shall also be used between the final pump station structure and the force main.

9. SURGE CONTROL

- a. Hydraulic surges and transients (water hammer) are dependent on a force main's size, length, profile, construction materials, and pump operating pressure. Pipe pressure tests and thrust restraint shall be based on maximum transient conditions, including an appropriate margin for safety.



10. THRUST RESTRAINT

- a. Thrust forces in pressurized pipelines shall be restrained or anchored to prevent excessive movement and joint separation under all projected conditions. Common methods include internal axial restraint.

11. PIG LAUNCHING/RETRIEVAL FACILITIES

- a. When required, pig launchers shall be provided and special care shall be given to designing the force main terminus to include a pig catcher and the ability to remove materials driven out of the force main by the pig.
- b. Pig launchers shall include proper valving so that a pig launcher can be isolated from the force main. After the pig is inserted into the line, the valves are adjusted to drive the pig through the force main using the force of the pumps. Additional water may be added to the wet-well to decrease the travel time in the force main.
- c. Pig launching facilities shall include a launch chamber, bypass piping, valves, and gauges to monitor pressure.
- d. Retrieval facilities shall be mirror images of the launch device. Baskets, traps, or screens placed in the receiving manhole for retrieval methods shall be as approved by City Engineer.

508.02.K FABRICATED STEEL SURFACE FINISH

1. Steel fabrications shall be 304 stainless steel or hot dipped galvanized. Corrosion resistant painting shall be required on valves, piping, and pipe fittings or other items that cannot be hot dipped galvanized.

508.02.L CODE AUTHORITY

1. Pump station and related facilities will be constructed in conformance with applicable Electrical, Building, and Fire Codes.

508.02.M OPERATING AND MAINTENANCE DATA

1. An operation and maintenance (O&M) manual including all product data and related information necessary for the City's operation and maintenance of all products and systems provided with the pump station shall be provided.
2. During the design of sewer pump stations, consideration shall be given to operations and maintenance (O&M) needs. The O&M manual shall include provisions for:
 - ❖ Detailed descriptions of all operating processes and procedures.
 - ❖ Design data for pumps, motors, force main, standby power, overflow point and elevation, telemetry, and sulfide control system, as applicable.
 - ❖ Pump curve with computed system curve showing design operating point.
 - ❖ Startup and shutdown procedures (step by step instructions).
 - ❖ Analysis of critical safety issues.
 - ❖ Inventory of critical components, including nameplate data for pumps and motors, etc.



- ❖ Description of the maintenance management system, including preventive and predictive maintenance.
 - ❖ Vulnerability analysis.
 - ❖ Contingency plan, including redundancy considerations.
 - ❖ List of affected agencies and utilities, including after-hour contacts.
 - ❖ List of local contractors for emergency repairs, including after-hours contacts.
 - ❖ List of vendors and manufacturers of critical system components, including after-hour contacts.
 - ❖ Staff training plan.
 - ❖ Stand-by generator exercising and operation instructions.
 - ❖ As-Built Drawings. All construction changes and location of underground pipe, conduit, buried facilities, shall be recorded by the contractor and be made part of the record drawings.
3. The O&M manual shall conform to the guidelines as set forth in the Oregon DEQ publication "Guidelines for Writing Pump Station O&M Manuals".
 4. All O&M information and manufacturer's cut sheets shall be originals. Copies will not be accepted. Provide a minimum of 5 originals.

508.02.N SPARE PARTS OR TOOLS

1. Supply two (2) sets each of all gaskets, bearings, mechanical seals for rotating equipment, and other spare parts or special tools as deemed appropriate by the Public Works Superintendent.

509 TRENCHLESS TECHNOLOGIES

509.01 GENERAL

- 509.01.A** Trenchless techniques for new construction include: micro-tunneling or directional boring, auguring or boring, pipe jacking, and other mining type operations. Costs, topography, or other issues that may preclude traditional open cut and excavation methods will most often direct the use of these techniques.
- 509.01.B** The trenchless technologies are available for sewer system rehabilitation/replacement to preserve structural integrity and reduce Infiltration/Inflow. There are a number of products available from a variety of manufacturers and Contractors to help meet these objectives.
- 509.01.C** Design Engineers shall take care to verify that a certain class of product is suited for its proposed application and that a specific product and its installer meet appropriate standards, including successful performance history. The purpose of this section is to highlight the advantages, disadvantages, and other issues for the various classes of sewer rehabilitation/replacement products.



509.01.D The following rehabilitation/replacement techniques that are approved to use for sewers within the City are discussed in the following Tables.

Sliplining		
Sliplining is a trenchless rehabilitation. Sliplining is the insertion of a new pipe, either continuous (typically butt-fused HDPE) or segmented (typically PVC, ductile iron, or HDPE), of smaller diameter into an existing pipe.		
Advantages	Disadvantages	Issues
<ul style="list-style-type: none">• Economical.• Strong.• Bypass pumping of sewage may not be needed (for segmented slipliner pipe).	<ul style="list-style-type: none">• Hydraulic capacity reduced.• Entry pits usually required.• Service lateral connections must be excavated.	<ul style="list-style-type: none">• Flotation of liner must be prevented during grouting of annular space.• Condition of existing pipe may limit length of slipliner runs between pits, diameter of slipliner pipe, and/or lengths of segmented pipe pieces.

Cured-in-place Pipe (CIPP)		
CIPP is a trenchless rehabilitation. The CIPP lining process consists of inverting a resin impregnated flexible tube into an existing pipe using hydrostatic head or air pressure. The resin is cured using heat.		
Advantages	Disadvantages	Issues
<ul style="list-style-type: none">• No access pits.• Service laterals can be internally reopened.• Minimal annular space.• Suitable for various cross sectional shapes.• Strength can be selected as a function of liner thickness and resin formula.• Manholes can be rehabilitated rather than replaced.	<ul style="list-style-type: none">• Bypass pumping of sewage is required.• Limited local competition.	<ul style="list-style-type: none">• Liner wet-out with resin must be ensured.• Resin pot life must not be exceeded.• Proper curing temperatures and times must be maintained.• I/I must be controlled during installation.• Expertise and performance of manufacturer and installer must be ensured.

**Pipe Bursting**

Pipe bursting is a trenchless replacement. Through pipe bursting, the existing pipeline is fragmented and forced into the surrounding soil by pulling a bursting head through the line. A new pipe (typically butt-fused HDPE) of equal or larger diameter is pulled behind the bursting head. New manholes are usually provided at insertion and withdrawal pits.

Advantages	Disadvantages	Issues
<ul style="list-style-type: none">• Creates a new, strong pipeline, not just rehabilitation of existing pipes.• Capacity can be increased.• Preparation of existing line is not critical.	<ul style="list-style-type: none">• Entry pits are required.• Service lateral connections must be excavated.• Bypass pumping of sewage required.• Manholes usually must be replaced.	<ul style="list-style-type: none">• Condition and location of adjacent buried utilities and foundations as well as surface improvements, should be considered• Dense or rocky soil may limit suitability of this method.

Point Repairs

Point repairs can structurally rehabilitate and eliminate infiltration in short sections of lines by such methods as short CIPP liners, epoxy resins, and structural grouting sleeves. Defects such as protruding laterals can be repaired by robotic grinding. Point repairs may be needed to properly prepare the line for some of the manhole to- manhole rehabilitation/replacement options described in the techniques listed above.

Advantages	Disadvantages	Issues
<ul style="list-style-type: none">• Economical.• Repairs only what is needed.	<ul style="list-style-type: none">• May not be appropriate for old lines if many more repairs may be needed in near future.	<ul style="list-style-type: none">• Goals of project must be considered, along with cost estimates, to ensure manhole-to manhole rehabilitation and replacement is not warranted.

509.01.E Other rehabilitation/replacement techniques including Fold and Form (PVC and HDPE), Spiral Wound PVC, fiberglass linings, cement mortar lining, sprayed coatings, and others will be reviewed and considered on a case-by-case basis, and will only be allowed in certain applications at the approval of the City Engineer.

509.02 PRIVATE SEWER SERVICE LATERAL REPAIRS

509.02.A Private sewer service laterals are sewer lines that connect building sewers on private property to the public sewer main in the public right-of-way or easements.

509.02.B Research studies by EPA and others indicate that a significant percentage of system-wide I/I is caused by private property sources. These include sump pumps, foundation drains, roof drains, and defects in service laterals. Service lateral defects include cracked, broken, or open jointed laterals. In addition, infiltration frequently occurs at a leaky connection of the lateral to the sewer main.



509.02.C Repair of service lateral defects can be accomplished using many of the same methods listed above for sewer mains. Chemical grouting, CIPP lining, and pipe bursting, in addition to open cut excavation and replacement shall be considered for repair of service laterals, where required.

509.02.D In cases where sewage backups have occurred through service laterals and into buildings, installation of backwater valves provides an immediate solution until the longer term sewer system rehabilitation/replacement program shows results. Backwater valves are typically installed beneath basement floor slabs on that portion of the building drain serving the basement only. This allows plumbing fixtures on the main floor and above to drain even during times when the sewer main is surcharged.

509.03 MANHOLE REHABILITATION

509.03.A Manhole rehabilitation can be performed to correct structural deficiencies, address maintenance concerns, and/or eliminate I/I. Manhole rehabilitation options which shall be considered when required include lining, sealing, grouting, or replacing various components or the entire manhole. The rehabilitation method selected depends on whether inflow or infiltration, or both, is to be eliminated and whether structural integrity is an issue. Inflow typically occurs through holes in the manhole cover or around the manhole frame and cover.

509.03.B When inflow occurs or is likely to occur, manhole covers shall be sealed by replacing them entirely with new watertight covers with rubber covered gaskets, rubber vents, and pick hole plugs, or by installing watertight inserts under the existing manhole covers (inflow protectors). Inflow protectors shall contain vacuum and gas release valves.

509.03.C Chemical grouting shall be considered as a method to eliminate infiltration.

END OF DIVISION